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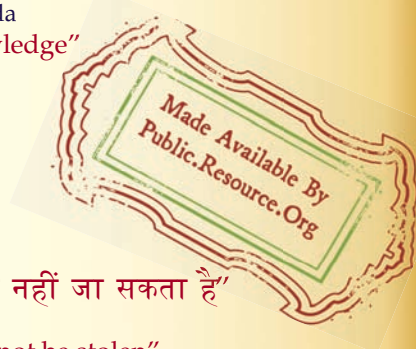
IS 13207 (1991): Automotive Vehicles Hydraulic Braking Systems - Wheel Cylinder Performance Requirements [TED 4: Automotive Braking Systems]



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भारतीय मानक

स्वचालित वाहन — द्रवचालित ब्रेकिंग तंत्र —
पहिया सिलिंडर — कार्यकारिता अपेक्षाएं

Indian Standard

**AUTOMOTIVE VEHICLES — HYDRAULIC
BRAKING SYSTEMS — WHEEL CYLINDER
PERFORMANCE REQUIREMENTS**

UDC 629.113-592.2-222 : 620.16

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**BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002**

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Braking System Sectional Committee had been approved by the Transport Engineering Division Council.

Braking system components play a very vital role in the functioning of an automotive. This Indian Standard specifies the performance requirements for wheel cylinders used in drum brake assemblies of a hydraulic brake system.

In the preparation of this standard assistance has been derived from the following:

- SAE J 101 — Hydraulic wheel cylinders for automotive drum brakes. Society of Automotive Engineers, USA.**
- JIS D 2604 — Hydraulic brake wheel cylinders for automobiles. Japanese Industrial Standards Committee, Japan.**

AMENDMENT NO. 1 JUNE 2007
TO
IS 13207 : 1991 AUTOMOTIVE VEHICLES — HYDRAULIC
BRAKING SYSTEMS — WHEEL CYLINDER
PERFORMANCE REQUIREMENTS

(Page 3, clause 5.4.2.2, line 3) — Substitute '16 000 cycles' for '160 000 cycles'.

(Pages 3 and 4, clause 5.5.2, last line) — Substitute 'and store the cylinder for 7 days at room temperature' for 'and stroke the cylinder for 7 days at room temperature'.

(Page 4, clause 5.5.6) — Substitute 'leakage test as per 5.2' for 'leakage test per as per 5.2'.

(TED 4)

Indian Standard

AUTOMOTIVE VEHICLES — HYDRAULIC BRAKING SYSTEMS — WHEEL CYLINDER PERFORMANCE REQUIREMENTS

1 SCOPE

1.1 This standard specifies the performance requirements and test method for wheel cylinders used in automotive hydraulic braking systems.

1.2 This standard is applicable to new assemblies from production.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
8654 : 1986	Automotive hydraulic brake fluid, heavy duty (<i>first revision</i>)
12884 : 1990	Braking system—Rubber boots for brake wheel cylinders—Performance requirement
13225 : 1991	Automotive vehicles—Hydraulic braking systems — Rubber cups — Specification

3 GENERAL REQUIREMENTS

Visual inspection is to be carried out as per the following:

- a) The metallic parts shall be given a suitable anti-rust treatment;
- b) There shall be no dust, powder, chipping etc, inside the cylinder body; and
- c) The sliding surface of the cup of the cylinder body shall be free from harmful defects such as dent, pin hole, rust, etc.

4 PERFORMANCE REQUIREMENTS

The following tests shall be carried out on the wheel cylinder assembly for assessing its performance:

- a) Unrestricted application and release
- b) Applied leakage
- c) Strength

d) Humidity operation

e) Storage corrosion

f) Static leakage

g) Heat pressure stroking (for rubber cups)

h) Low temperature performance (for rubber cups)

j) Ozone resistance (for rubber cups)

5 TESTS

The test arrangement is shown in Fig. 1.

5.1 Unrestricted Application and Release

5.1.1 Test Specimen, one complete wheel cylinder assembly.

5.1.2 Procedure

Remove the protective plugs from the wheel cylinder inlet port(s) and fully stroke the cylinder 5 times by hand and allow it to return under the piston return spring load. In the absence of a piston return spring, apply 34 kPa air pressure to the inlet port until the cylinder returns to its original position, 5 times. Record the time for return on fifth stroke.

NOTE — Avoid stroking the wheel cylinder cups into the bleed screw and/or hydraulic inlet openings during this test.

5.1.3 The piston(s) shall move smoothly throughout full stroke after starting and return to original position on the fifth stroke within 30 seconds by the force of the piston return spring or in the absence of return spring by 34 kPa maximum air pressure at inlet port.

5.2 Applied Leakage

5.2.1 Test Specimen, one complete wheel cylinder assembly.

5.2.2 Procedure

Install the wheel cylinder on its load fixture and tighten the mounting bolts. Assemble the connecting links axially to the wheel cylinder

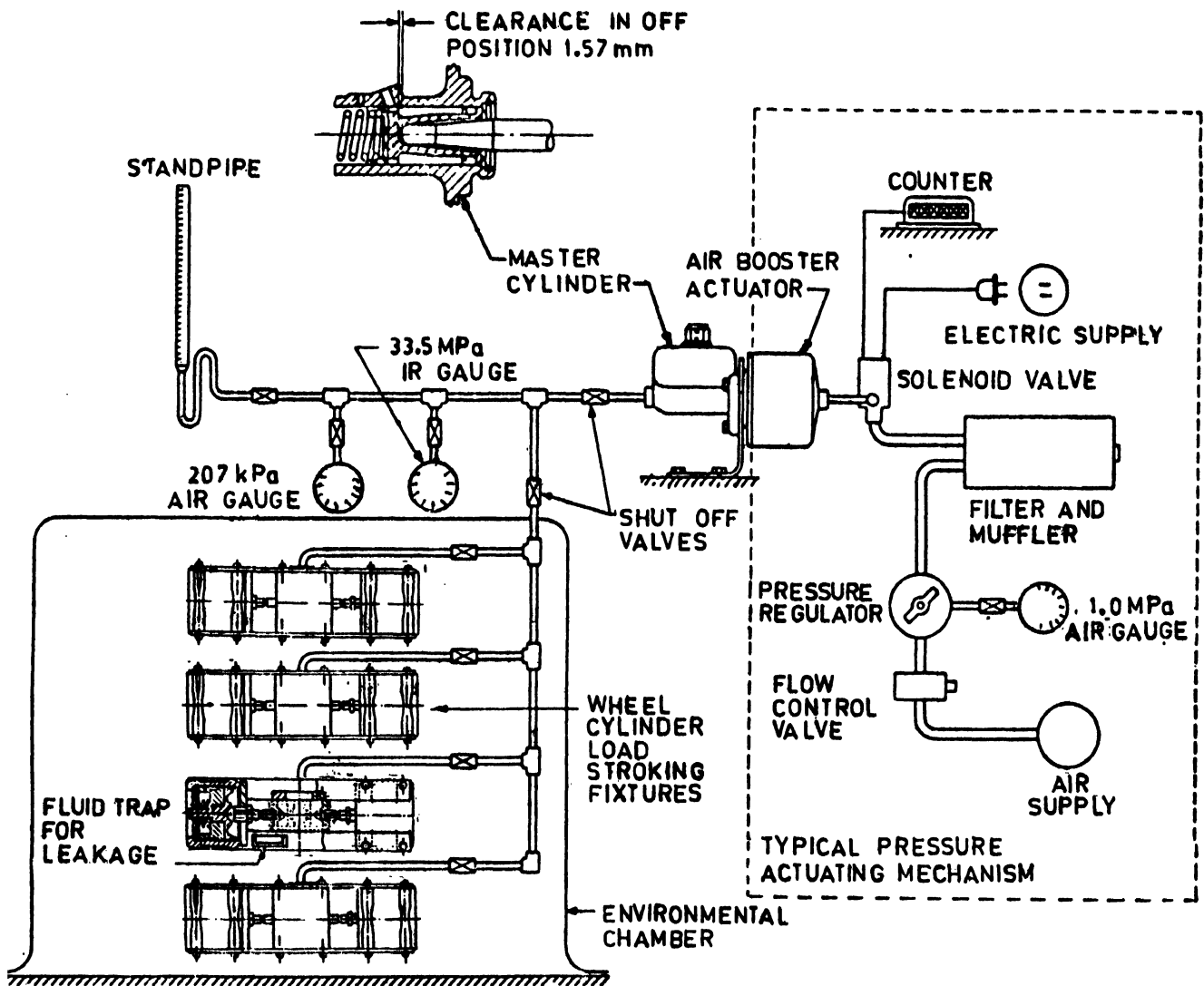


FIG. 1 TEST APPARATUS

bore as shown in Fig. 2 and adjust so that the piston(s) is (are) in the release position. Fill the test set up with new hydraulic brake fluid conforming to IS 8654 : 1986 and bleed at all points to remove air.

5.2.2.1 Apply the master cylinder to build up 139 kPa pressure in the system, shut off the valve to the master cylinder, and release the master cylinder. Allow the wheel cylinder pressure to stabilize for 15 to 20 seconds and record the pressure at the beginning and end of 30 seconds interval.

5.2.2.2 Open the valve to the master cylinder, close the low pressure gauge(s). Apply the master cylinder to build up 6.9 MPa pressure in the system. Shut off the valve to the master

cylinder, and release the master cylinder. Allow the wheel cylinder pressure to stabilize for 15 to 20 seconds and record the pressure at the beginning and end of 30 seconds interval.

5.2.3 There shall be no pressure drop in excess of 7 kPa after an interval of 30 ± 1 seconds when subjected to 139 kPa pressure.

5.2.4 When tested at 6.9 MPa the pressure drop shall not exceed 345 kPa after an interval of 30 ± 1 seconds.

5.3 Strength

5.3.1 Test Specimen, one complete wheel cylinder assembly.

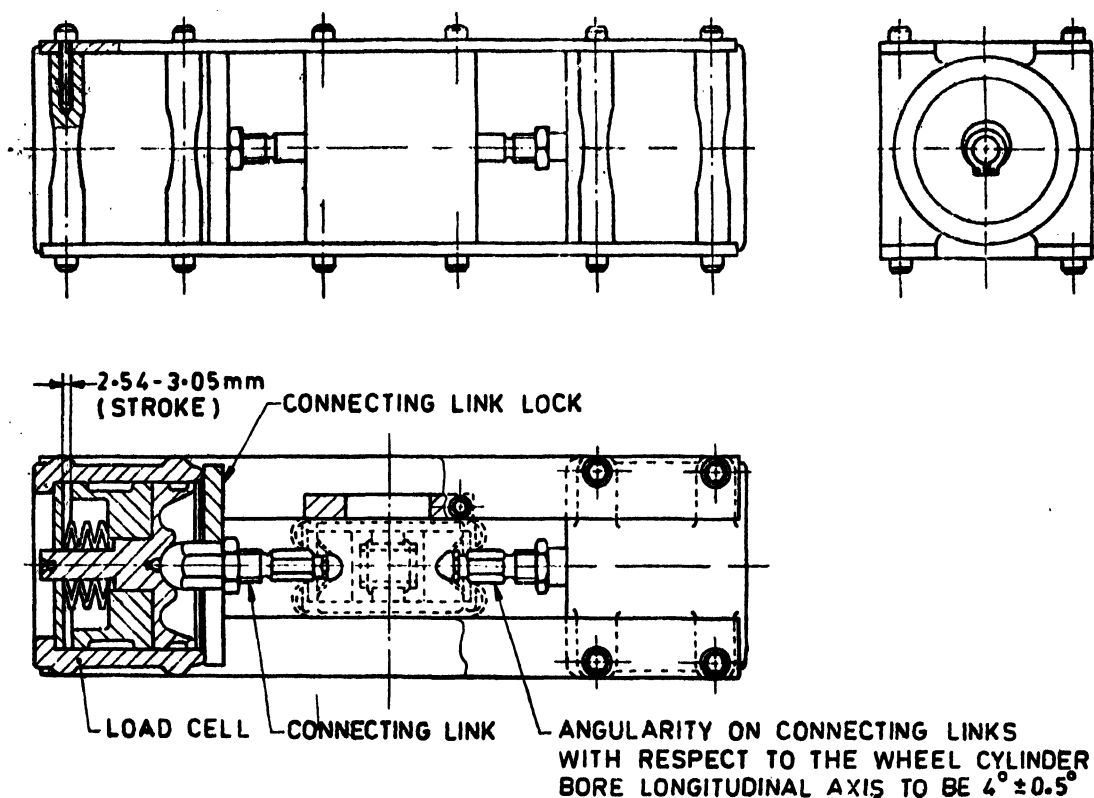


FIG. 2 WHEEL CYLINDER LOAD FIXTURE

5.3.2 Procedure

Open the valve to the master cylinder and apply the master cylinder to build up a test pressure of 25 000 kPa in the system. Hold the pressure for 15 ± 5 seconds then release the master cylinder.

5.3.3 Observe the pressure gauge during the test and visually inspect the wheel cylinder and its mounting afterwards for sign of leaks or structural failure.

5.3.4 The wheel cylinder assembly shall not reveal any abrupt decline in pressure. The cylinder shall not have any structural failure or any sign of leakage.

5.4 Humidity Operation

5.4.1 Test Specimen, one complete wheel cylinder assembly.

5.4.2 Procedure

Place the load fixture(s) with the wheel cylinder(s) in the humidity cabinet. Set the pressure actuating mechanism for cyclic operation at $1\,000 \pm 100$ cycles/hour and adjust it to build up a master cylinder output pressure of 3.4 MPa and piston travel of 3.05 ± 0.5 mm.

Stroke for 8 hours at 46°C temperature and 95 ± 3 percent relative humidity and then cease stroking for 16 hours while at 21°C temperature and resultant relative humidity. Repeat the sequence.

5.4.2.1 Periodically observe the wheel cylinder action during stroking.

5.4.2.2 Remove the load fixture(s) with the wheel cylinder(s) from the humidity cabinet at the end of the second day (160 000 cycles stroking and 32 hours static). Carry out applied leakage test as per 5.2.

5.4.3 The wheel cylinder piston(s) shall return to full release stop within a stroke cycle of the master cylinder, and the wheel cylinder shall meet the applied leakage measurements.

5.5 Storage Corrosion

5.5.1 Test Specimen, one complete wheel cylinder assembly.

5.5.2 Procedure

Fill the test set up with new hydraulic brake-fluid—Heavy duty conforming to IS 8654 : 1986 and bleed air from the wheel cylinder by stroking until the existing fluid stream is free of

air bubbles. Remove the wheel cylinder connector at its juncture with the line to the master cylinder, taking care not to empty fluid from the wheel cylinder or its connecting tubing/hose. With the wheel cylinder on its load fixture or a like device which holds the piston(s) in release position, place empty leak trap(s) under the cylinder boot(s) and stroke the cylinder for 7 days at room temperature.

5.5.2.1 At the end of 7 days, examine the cylinder for visible leakage.

5.5.2.2 Remove the piston clamps and remount the cylinder on the load fixture or like device allowing equivalent piston stroke. Re-attach the cylinder to the test apparatus or equivalent and build up hydraulic pressure gradually until the piston(s) starts to move, measure and record the pressure.

5.5.2.3 Continue the pressure build up until 3.4 MPa is achieved and release it, meanwhile observing the wheel cylinder action.

5.5.2.4 Carry out applied leakage test as per 5.2.

5.5.3 At the end of 7 days when checked, the number of drops under the boots shall not exceed 5 (0.25 ml).

5.5.4 When hydraulic pressure is built up, at the end of 7 days, the piston shall start to move at 276 kPa.

5.5.5 The wheel cylinder piston (s) shall return to full release stop when 3.4 MPa is reached.

5.5.6 The cylinder shall also conform to applied leakage test ~~per~~ as per 5.2.

5.6 Static Leakage

5.6.1 Test Specimen, one complete wheel cylinder assembly.

5.6.2 Procedure

Remove the wheel cylinder boot(s) and drain any fluid which might be present. Shut off the valve to the master cylinder and open the valve from the wheel cylinder to the stand pipe. Fill the stand pipe with new fluid and let the system stand idle for 12 to 18 hours with leak traps under each open end of the cylinder. Measure any fluid leakage at the end of 12 to 18 hours.

5.6.3 There shall be no visible fluid leakage through either end of the cylinder.

5.7 Heat Pressure Strokings (for Rubber Cups)

5.7.1 The wheel cylinder rubber cups when tested as per IS 13225 : 1991 shall comply with the following:

- i) *Lip diameter change* — The minimum lip diameter of wheel cylinder cups after the stroking test shall be greater than the wheel cylinder bore by the minimum dimensions as tabulated below.

<i>Wheel Cylinder Cups Diameter in</i>	<i>Excess over Bore</i>
mm	mm
Up to 25.4	0.508
Over 25.4 up to 38.1	0.635
Over 38.1 up to 50.8	0.762

- ii) *Leakage* — Constant dampness past the cups or fluid discoloration of the filter paper on two or more inspections shall be cause for rejection.
- iii) *Change in hardness* — Rubber cups shall not decrease in hardness by more than 15 deg IRH, or the primary and secondary master cylinder test cups shall not decrease in hardness by more than 15 deg IRH.
- iv) *Conditions of test cups* — The primary and secondary cups shall not show excessive deterioration such as scoring, scuffing, blistering, cracking, chipping (heel abrasion), or change in shape from original appearance.

5.8 Low Temperature Performance (for Rubber Cups)

5.8.1 The wheel cylinder rubber cups when tested as per IS 13225 : 1991 shall not show any leakage of fluid. On subjecting the test cups to a temperature of — 40 to — 43°C for 22 hours, no cracking shall be observed and the cup shall return to its approximate original shape within 1 minute after the bend test.

5.9 Ozone Resistance (for Rubber Cups)

5.9.1 At the end of 70 hour's exposure period, the surface of the specimen of wheel cylinder rubber cups, when tested as per Annex H of IS 13225 : 1991 shall show no evidence of cracking, rupture or other deterioration, when seen under 2 × magnification.

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Doc : No. TED 4 (001)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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